Blue light screening in the lichenized fungal genus *Lobaria* depends on photobiont type

Li Xie and Knut Asbjørn Solhaug

Department of Biology and Natural Resource Management, Norwegian University of Life Sciences, P.O. Box 5003, NO-1432 Ås, Norway, li.xie@student.umb.no

Lichens are symbiotic associations between a mycobiont and one or more photobionts (green algae and/or cyanobacteria). Cyanolichens have phycocyanins that mainly absorb light in the green part of the spectrum. Thereby, phycocyanins enhance the utilization of light transmitted through a canopy. The combination of phycocyanins and chl *a* may thus improve photosynthesis in shaded forest sites.

We compared the green algal lichen *Lobaria pulmonaria* and the cyanolichen *L. hallii* by measuring light response curves for photosynthetic CO_2 uptake, O_2 evolution, as well as apparent electron transport rate (ETR) in blue, green and red light, respectively. Maximal photosynthetic CO_2 uptake was slightly higher for the cyanolichen *L. hallii* than for the green algal *L. pulmonaria* in green light. In red light there was no difference in maximal CO_2 uptake between the species, whereas the cyanolichen had substantially lower photosynthesis in blue light. The same trend occurred for photosynthetic O_2 evolution. Apparent electron transport rate (ETR) measured with chlorophyll fluorescence did not differ between red and green light in any of the species. For the cyanolichen, ETR showed no sign of light saturation in blue light, indicating that little blue light is used in photosynthesis.

Reflectance spectra showed that green light was less reflected in the cyanolichen, which may partly explain the slightly higher cyanobacterial photosynthetic CO_2 uptake. At the same time, the reflectance patterns in the blue region cannot explain the reduced photosynthesis in cyanobacterial lichens. Transmittance of light through the combined cortex and photobiont layer indicated that also the blue light was efficiently absorbed. Screening was estimated indirectly by comparing chlorophyll fluorescence ratios between chlorophyll fluorescence excited with blue and red light. Much lower blue/red ratios occurred in the cyanolichen *L. hallii* than in the green algal lichen *L. pulmonaria*, indicating that screening of blue light in the cyanolichen inhibited blue light from reaching the photosynthetic apparatus. It is not known whether the screening occurs in the lichen cortex or due to pigments located outside cyanobacterial cells.